

HE  
18.5  
.A34  
no.  
DOT-  
TSC-  
NHTSA-  
78-38

NOS. DOT-TSC-NHTSA-78-38

HS-803-547

## STUDY OF CONSUMER AUTOMOTIVE PREFERENCE WITH REGARD TO FUEL ECONOMY MEASURES

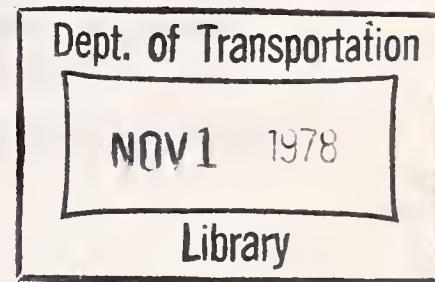
Paul E. Green  
Peter W. Rogers

Rogers National Research, Inc.  
5800 Monroe Street  
Sylvania OH 43560



SEPTEMBER 1978

FINAL REPORT



DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC  
THROUGH THE NATIONAL TECHNICAL  
INFORMATION SERVICE, SPRINGFIELD,  
VIRGINIA 22161

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Research and Development  
Washington DC 20590

**NOTICE**

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

**NOTICE**

The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

1. Report No. HS-803-547	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle  STUDY OF CONSUMER AUTOMOTIVE PREFERENCE WITH REGARD TO FUEL ECONOMY MEASURES		5. Report Date September 1978	
7. Author(s) Paul E. Green and Peter W. Rogers		6. Performing Organization Code DOT-TSC-1391	
9. Performing Organization Name and Address Rogers National Research, Inc.* 5800 Monroe Street Sylvania OH 43560		8. Performing Organization Report No. DOT-TSC-NHTSA-78-38	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Research and Development Washington DC 20590		10. Work Unit No. (TRAIS) HS827/R8407	
		11. Contract or Grant No. DOT-TSC-1391	
		13. Type of Report and Period Covered Final Report July 1977 to May 1978	
15. Supplementary Notes *Under contract to: Research and Special Programs Administration Transportation Systems Center Cambridge MA 02142		14. Sponsoring Agency Code	
16. Abstract  An analysis is made of the effects of size and weight reduction of 1977 General Motors standard size cars. A buyer profile describing demographic characteristics, age, sex, education, marital status, size of family and income by make is prepared for 1976 and 1977 General Motors standard size cars, and 1977 Ford Motor Company and Chrysler Corporation cars. The analysis focuses on testing whether significant differences exist between the average attitudinal, behavioral, and demographic profiles of two <u>a priori</u> defined groups - buyers of downsized and buyers of non-downsized cars. Multivariate analysis determined the variables that were the major discriminants. It is shown that attributes related to fuel economy are important discriminants distinguishing buyers of downsized standards from non-downsized standard size cars. Those who purchased the downsized cars did so with the expectations (that were fulfilled) of better fuel economy, as well as increased maneuverability and ease of parking. They reinforced the pursuit of fuel economy by also choosing 6-cylinder engines and manual transmissions to a greater extent. Share of market, market composition, source of sales, and owner loyalty are discussed. It is concluded that the General Motors Corporation downsizing of its standard size cars was a significant fuel economy measure and a success in the market.			
17. Key Words Buyer profile Owner loyalty Downsizing Significant variables Fuel economy Market share		18. Distribution Statement  DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161	<b>Dept. of Transportation</b>  <b>NOV 1 1978</b>  <b>Library</b>
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 48	22. Price



197

## PREFACE

The first major downsizing of automobiles occurred in the 1977 model year as General Motors Corporation downsized its entire line of standard size cars. This report is an assessment of the effect of that downsizing effort on early model buyers and on the composition of the market.

The study has two principal objectives. The first is to prepare a profile of buyers of 1976 and 1977 model year General Motors standard size cars and 1977 model year Ford Motor Company and Chrysler Corporation standard size cars.

These buyer profiles have been prepared and are presented in Volume II which is delivered under the Data Use Restriction Provisions. The data source for the buyer profiles is a proprietary data bank of 90,581 buyers of 1976 and 1977 model year cars, previously assembled by Rogers National Research, Inc., from a national probability sampling of buyers of all domestic and high volume import cars.

The second principal objective, reported in this volume, is to analyze the buyer profiles and other related attributes of the buyers of the standard size cars of the three major domestic manufacturers for model years 1976 and 1977. This analysis focuses on identifying those variables that significantly distinguish buyers of General Motors standard size cars that were downsized from buyers of General Motors standard size cars that were not downsized — and from buyers of other domestic standard size cars that were not downsized. The analysis is multivariate and includes discriminant analysis within and across model years, multivariate significance testing of all predictor variables, and canonical mapping of appropriate manufacturer, segment, and model year comparison groups.

The multivariate analysis was performed by Dr. Paul E. Green, S. S. Kresge Professor of Marketing, Wharton School, University of Pennsylvania.

## METRIC CONVERSION FACTORS

### Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>								
in	inches	2.5	centimeters	mm	millimeters	0.04	inches	in
ft	feet	30	centimeters	cm	centimeters	0.4	inches	in
yd	yards	0.9	meters	m	meters	3.3	feet	ft
mi	miles	1.6	kilometers	km	kilometers	1.1	yards	yd
<b>AREA</b>								
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>	square centimeters	0.16	square inches	in <sup>2</sup>
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>	square meters	1.2	square yards	yd <sup>2</sup>
yd <sup>2</sup>	square yards	0.8	square kilometers	km <sup>2</sup>	square kilometers	0.4	square miles	mi <sup>2</sup>
mi <sup>2</sup>	square miles	2.6	hectares	ha	hectares (10,000 m <sup>2</sup> )	2.5	acres	ac
<b>MASS (weight)</b>								
oz	ounces	28	grams	g	grams	0.026	ounces	oz
lb	pounds	0.45	kilograms	kg	kilograms	2.2	pounds	lb
(2000 lb)	short tons	0.9	tonnes	t	tonnes (1000 kg)	1.1	short tons	ts
<b>VOLUME</b>								
teaspoons	5	milliliters	ml	milliliters	0.03	fluid ounces	fl oz	
tablespoons	15	milliliters	ml	liters	2.1	pints	pt	
fluid ounces	30	milliliters	ml	liters	1.06	gallons	gal	
cups	0.24	liters	l	cubic meters	0.26	cubic feet	cu ft	
pints	0.47	liters	l	cubic meters	35	cubic yards	cu yd	
quarts	0.95	liters	l	cubic meters	1.3			
gallons	3.8	cubic meters	m <sup>3</sup>					
cubic feet	0.03	cubic meters	m <sup>3</sup>					
cubic yards	0.76	cubic meters	m <sup>3</sup>					
<b>TEMPERATURE (exact)</b>								
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

## TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
PREFACE.....		iii
INTRODUCTION.....		vii
1. STUDY DESCRIPTION.....		1
1.1 Background.....		1
1.2 Downsizing.....		2
1.3 Objective.....		3
1.4 Source of Data.....		4
1.5 Methodology.....		4
2. SUMMARY OF MULTIVARIATE ANALYSIS.....		6
2.1 1977 Chevrolet vs. 1977 Ford, 1977 Plymouth..		6
2.2 1977 Buick, Oldsmobile, Pontiac, Cadillac vs. 1977 Mercury, Dodge, Chrysler, Lincoln Continental.....		8
2.3 1977 Chevrolet vs. 1976 Chevrolet.....		9
2.4 1977 vs. 1976 Buick, Oldsmobile, Pontiac and Cadillac.....		11
2.5 Variables That Distinguish 1977 GM Make/Series Loyals From Non-Loyals.....		12
3. MARKET BEHAVIOR.....		13
3.1 Sales Statistics.....		13
3.2 Retail Sales.....		13
3.3 Registrations.....		13
3.4 Reporting Time Frames.....		14
3.5 Share of Market.....		14
3.6 Changes in Market Composition.....		15
3.7 Source of Sales.....		15
3.8 Owner Loyalty - Low Price Standards.....		17
3.9 Owner Loyalty - Medium Price Standards.....		18
3.10 Owner Loyalty - High Price Standards.....		18
3.11 Reasons for Make Selection.....		19
4. CONCLUSIONS.....		21
APPENDIX A - TABLES.....		23
APPENDIX B - REPORT OF NEW TECHNOLOGY.....		40

## LIST OF TABLES

<u>TABLE</u>		<u>Page</u>
1	1976 BODY TYPE CLASSIFICATION USED BY GENERAL MOTORS CORPORATION.....	23
2	MARKET SEGMENT CLASSIFICATION 1976 MODEL YEAR.....	24
3	DIMENSIONS OF GENERAL MOTORS 1976 AND 1977 STANDARD SIZE MAKES.....	25
4	DIMENSIONS OF FORD MOTOR COMPANY 1976 AND 1977 STANDARD SIZE MAKES.....	26
5	DIMENSIONS OF CHRYSLER CORPORATION 1976 AND 1977 STANDARD SIZE MAKES.....	27
6	PREDICTOR VARIABLES.....	28
7	1977 CHEVROLET STANDARD SIZE VERSUS 1977 FORD/PLYMOUTH STANDARD SIZE CARS.....	30
8	1976 CHEVROLET STANDARD SIZE VERSUS 1976 FORD/PLYMOUTH STANDARD SIZE CARS.....	31
9	1976 GM MEDIUM AND HIGH PRICE STANDARD SIZE VERSUS 1976 FORD AND CHRYSLER MEDIUM AND HIGH PRICE STANDARD SIZE.....	32
10	1977 GM MEDIUM AND HIGH PRICE STANDARD SIZE VERSUS 1977 FORD AND CHRYSLER MEDIUM AND HIGH PRICE STANDARD SIZE.....	33
11	1977 CHEVROLET STANDARD SIZE VERSUS 1976 CHEVROLET STANDARD SIZE.....	34
12	1977 VS. 1976 BUICK, OLDSMOBILE, PONTIAC, CADILLAC.....	35
13	VARIABLES THAT DISTINGUISH 1977-MODEL CHEVROLET STANDARD MAKE/SERIES NON-LOYALS FROM LOYALS.....	36
14	VARIABLES THAT DISTINGUISH 1977-MODEL BUICK, OLDSMOBILE, PONTIAC AND CADILLAC MAKE/SERIES NON-LOYALS FROM LOYALS.....	37
15	NEW CAR SALES.....	38
16	NEW CAR REGISTRATIONS.....	39

## INTRODUCTION

Recognition by the automotive industry of the serious nature of a growing energy problem pre-dated the oil embargo of late 1973 and the subsequent Energy and Conservation Act of 1975.

As early as 1972, the board of directors of General Motors Corporation created a task force to examine the energy issues. In March of 1973, after a half year of research, the energy task force reported its conclusions to the General Motors' Board of Directors. Among the conclusions, the task force reported that there was, in fact, an energy problem and that the energy problem would have a profound effect on General Motors Corporation's business.

But it was the oil embargo of October 1973 through March 1974 by the nine Arab oil producing nations that dramatically brought to a head the earlier warnings of economists and conservationists. Within 60 days of the oil embargo, the annual rate of new car sales fell by 2.4 million units, the price of regular gasoline went up 10 cents a gallon, and the demand for small cars jumped eight percentage points in its share of market. Motorists and the public at large voiced considerable concern as the threat of gasoline shortages became a reality. Suddenly, miles per gallon became the shopper's first question and the direction of the auto market changed overnight.

It was clear that the day of the "gas guzzler" had come to an end. Auto manufacturers launched crash programs to examine the best possible ways to improve fuel economy. Simultaneously, they turned to the consumer (in the form of consumer surveys) to determine how much importance car buyers attach to various car attributes that affect gasoline mileage — and the level of specific car attributes that the consumer was willing to give up or trade off to gain a higher level of fuel economy.

Plans aimed at fuel economy improvement started to take shape. Strategies and timing differed between manufacturers, but it became clear that the first major fuel economy improvement would come from weight reduction achieved through downsizing.

At General Motors, the decision was made in April 1973 to downsize the 1977 standard size cars with a reduction of about 400 pounds, calculated to improve fuel economy by about one mile per gallon. In October of 1973, the oil embargo shook the economy and by the end of the year it was apparent that fuel economy had become an overriding issue.

In December of 1973, GM reexamined its April decision and decided to expand on the corporate plan to downsize. The decision was made to substantially downsize the 1977 standard size cars and to follow on with the downsizing of the intermediates in model year 1978, and to continue downsizing other body sizes in the following years.

On December 27, 1975, the Energy and Conservation Act of 1975 (P. L. 94-163) became law. Title III Part A of the Act amended the Motor Vehicle Information and Cost Savings Act (P. L. 92-513) by adding Title V aimed at improving fuel efficiency of motor vehicles through enforcement of fuel standards for specific model years — 18 miles per gallon for passenger automobiles for model year 1978, 19 MPG for 1979, 20 MPG for 1980, and 27.5 MPG by 1985. Civil penalties for failure to achieve specified fuel economy standards were defined under the provisions of the Act.

The first major step by a domestic manufacturer to improve the fuel efficiency of passenger vehicles on a broad scale materialized with the introduction of the new "downsized" General Motors 1977 model year standard size cars.

Introduction of the new 1977 model year GM downsized standards also created a unique market condition. The market offerings in the standard size segment now consisted of the 1977 downsized GM standards that were significantly shorter and lighter than the traditionally competitive Ford and Chrysler cars that were not downsized.

The U. S. Department of Transportation, Transportation Systems Center, seeks to assess the effects of the size and weight reduction of the General Motors downsizing of its "standard" size cars on early model buyers and on the composition of the market.

This study addresses itself to that requirement.

## 1. STUDY DESCRIPTION

### 1.1 BACKGROUND

The automotive industry has traditionally categorized automobiles in terms of size and price class. While the "standard" size is probably the most clearly defined of the various size classes, confusion could exist because of some overlap between the two most commonly used classification systems.

General Motors Corporation classifies cars by the body groups shown in Appendix Table 1. Another commonly accepted classification system, however, is based on target market segmentations as shown in Appendix Table 2.

Beginning with 1977 model year, General Motors downsized both its "B Body" and "C Body" standard size cars. Specifically, the following makes were downsized in the 1977 model year.

<u>B BODY</u>	<u>C BODY</u>
Chevrolet Impala, Caprice	Cadillac DeVille, Fleetwood
Pontiac Catalina	Pontiac Bonneville
Buick LeSabre	Buick Electra
Oldsmobile Delta 88	Oldsmobile 98

Analysis of the impact of downsizing on early model buyers of 1977 model year cars is more appropriate, however, when these cars are grouped by the target market segments in which they traditionally compete. This is shown below for the General Motors standard size cars and the competing Ford Motor Company and Chrysler Corporation standard size cars.

#### LOW PRICE STANDARD SIZE

General Motors	—	Chevrolet Impala, Caprice
Ford Motor Co.	—	Ford LTD
Chrysler Corp.	—	Plymouth

#### MEDIUM PRICE STANDARD SIZE

General Motors	—	Pontiac Catalina, Bonneville
	—	Buick LeSabre, Electra
	—	Oldsmobile, Delta 88, 98
Ford Motor Co.	—	Mercury Marquis
Chrysler Corp.	—	Dodge
	—	Chrysler Newport, New Yorker

HIGH PRICE STANDARD SIZE

General Motors	-	Cadillac DeVille, Fleetwood
Ford Motor Co.	-	Lincoln Continental
Chrysler Corp.	-	none

## 1.2 DOWNSIZING

Downsizing refers generally to a reduction in the overall exterior dimensions of a vehicle. Its primary goal is weight reduction for the purpose of achieving better fuel economy (more miles per gallon of fuel). The product configuration strategy in the current downsizing aimed at reducing overall exterior dimensions while preserving the interior package dimensions to the extent possible. This was accomplished by reducing the wheelbase, overall length, overall width, and raising overall height about an inch.

Appendix Tables 3 through 5 list the exterior dimensions and curb weight of the standard size 1976 and 1977 model year standard size General Motors Corporation, Ford Motor Company, and Chrysler Corporation cars. It will be noted that the exterior size and curb weights of the cars produced by all three domestic manufacturers are quite similar within price class for the 1976 model year.

In the 1977 model year, however, the General Motors standard size cars were substantially reduced in exterior dimensions and curb weight. Overall length reductions ranged from 8.7 inches for the Buick LeSabre to 11.8 inches for the Oldsmobile 98. Curb weight reductions ranged from 590 pounds for the Chevrolet to 852 pounds for the Buick Electra.

The 1977 model year cars produced by Ford Motor Company and Chrysler Corporation on the other hand were not downsized and the exterior dimensions and curb weights remain approximately the same as their 1976 model year cars.

### 1.3 OBJECTIVE

The purpose of this study is to assess the effects of size and weight reduction of General Motors standard size cars on early model buyers.

This objective was to be achieved by the performance of four tasks specified by Contract DOT-TSC-1391.

TASK 1. Prepare profiles describing demographic characteristics of age, sex, education, marital status, size of family, and income by make for buyers of a General Motors standard size 1976 model year car.

TASK 2. Prepare profiles of buyers of General Motors downsized 1977 model year standard size cars.

TASK 3. Prepare profiles of buyers of Ford Motor Company and Chrysler Corporation 1977 standard size cars (not downsized).

TASK 4. Analyze the data determined in Tasks 1, 2 and 3 with particular emphasis on source of sales, repurchase loyalty, and comparisons of buyer perception and influence of weight on purchase decisions and reasons for buying particular makes.

#### 1.4 SOURCE OF DATA

The data source for this study was a proprietary data bank of 90,851 buyers of 1976 and 1977 model year buyers previously assembled by Rogers National Research from a national probability sample of all domestic and high volume import makes. Buyers were sampled in two identical time frames in each model year as shown below.

	Model Year		
	1976	1977	Total
October Buyers	23,169	23,313	46,482
Second Quarter Buyers (January, February and March)	20,674	23,425	44,099
	43,843	46,738	90,581

In fulfillment of Tasks 1, 2, and 3, buyer demographic profiles were extracted by combining both the October Buyer data and the Second Quarter Buyer data for each model year. Profiles of new car buyers of each standard size 1976 and 1977 model year make produced by General Motors, Ford Motor Company, and Chrysler Corporation are listed in Volume II.

The UAW strike at Ford Motor Company closed all 14 Ford assembly plants on September 14, 1976. The strike lasted 28 days which resulted in lack of Ford new car inventory and an atypical market in the month of October. For this reason, source of sales, owner loyalty, and most important reason for make selection tables were drawn from Second Quarter Buyer data only for both model years. These tables are included in Volume II.

#### 1.5 METHODOLOGY

The analysis (Task 4) focuses on testing whether significant differences exist between the average attitudinal, behavioral and demographic profiles of two a priori defined groups — buyers of downsized standard size cars and buyers of non-downsized standard size cars. In doing this, four major comparison groups were specified:

<u>DOWNSIZED</u>		<u>NOT DOWNSIZED</u>
1977 Chevrolet	vs.	1977 Ford/Plymouth
1977 Buick, Olds, Pontiac, Cadillac	vs.	1977 Mercury, Dodge, Chrysler, Lincoln Continental
1977 Chevrolet	vs.	1976 Chevrolet
1977 Buick, Olds, Pontiac, Cadillac	vs.	1976 Buick, Olds, Pontiac, Cadillac

Fifty different variables describing the buyers of each make were analyzed. Described by category below, the fifty variables are listed in Exhibit Table 6.

	<u>NUMBER OF VARIABLES</u>
Descriptive aspects of new car purchased	8
New car evaluative ratings	18
Fuel economy ratings	8
Corporate image	4
Owner satisfaction and repurchase intentions	2
Demographic profile	<u>10</u>
	50

Multivariate analysis narrowed the fifty variables down to those that significantly distinguished (at the 0.05 level of significance or better) between the appropriate downsized and not downsized groups. The analytical techniques employed were discriminant analysis within and across model year, multivariate significance testing of all predictor variables, and canonical mapping of appropriate make, manufacturer, segment and model year comparison groups.

## 2. SUMMARY OF MULTIVARIATE ANALYSIS

### 2.1 1977 CHEVROLET (DOWNSIZED) VS. 1977 FORD, 1977 PLYMOUTH (NOT DOWNSIZED)

Two group discriminant analysis reduced the 50 buyer variables to the 22 that distinguish 1977 Chevrolet buyers from 1977 Ford and Plymouth buyers. The average profiles on significant variables are shown in Appendix Table 7.

Similarly, two group discriminant analysis identified the seven (out of 50) variables that separate 1976 Chevrolet buyers from 1976 Ford and Plymouth buyers. This is shown in Appendix Table 8. All seven of the variables that distinguish the 1976 Chevrolet buyers from the 1976 Ford/Plymouth buyers also discriminate between the 1977 Chevrolet buyers and the 1977 Ford/Plymouth buyers. Since they appear in both sets (before and after downsizing), it can be assumed that these seven significant variables are not major discriminants resulting from downsizing — although the magnitude of their differences are affected. (As such, the 1976 model year can be considered as a control group.)

After subtracting the discriminating variables that appeared in both model years from those that separated the 1977 Chevrolet buyers from the 1977 Ford and Plymouth buyers, the remaining significant variables can be assumed to be discriminants more directly related to downsizing — or other changes that occurred between the 1976 to the 1977 model year.

Those variables unique to the 1977 model year are shown below. It is quite clear that attributes related to fuel economy are important discriminants distinguishing the 1977 Chevrolet buyers from the 1977 Ford and Plymouth buyers with seven of the eight fuel economy variables measuring out as significant variables. Buyers of 1977 Chevrolet show:

#### FUEL ECONOMY

- Higher percentage where expected gas mileage influenced decision to buy smaller car (30% for Chevrolet, 6% for Ford/Plymouth).
- Higher percentage where expected gas mileage influenced decision to buy this particular car (41% for Chevrolet, 22% for Ford/Plymouth).
- Better fuel economy rating.
- Better mileage, city and suburban.
- Higher percentage who found city and suburban mileage better than expected.

FUEL ECONOMY (Cont'd)

- Better highway mileage.
- Higher percentage who found highway mileage better than expected.

EVALUATIVE RATINGS

Better ratings on:

- Ease of parking.
- Maneuverability in city traffic.
- Useable trunk space.

Poorer ratings on:

- Overall exterior styling.
- Smoothness of transmission.

DESCRIPTIVE ASPECTS

- Higher percentage with 6 cylinder engine.

DEMOGRAPHICS

- More formal education.
- Higher percentage whose occupation is professional/managerial.

CORPORATE IMAGE

- Dropped an average of 9 percentage points while those of Ford and Plymouth remained approximately constant.

## 2.2 1977 BUICK, OLDSMOBILE, PONTIAC, CADILLAC (DOWNSIZED) VS. 1977 MERCURY, DODGE, CHRYSLER, LINCOLN CONTINENTAL (NOT DOWNSIZED)

Results of analyzing the downsized medium and high priced standards turned out to be very similar to those of the low price standards. In the case of the medium and high price standards, 12 of the 50 variables separated 1976 GM standards from competitive standards. (Appendix Table 9) All 12 of these significant variables also distinguished 1977 GM standards from competitive standards. (Appendix Table 10)

In addition, however, the following significant differences separate 1977 GM downsized standards from competitive standards that were not downsized. As was the case with the low priced standards, it is quite clear that attributes related to fuel economy are important discriminants distinguishing the 1977 Buick, Oldsmobile, Pontiac and Cadillac buyers from the 1977 Mercury, Dodge, Chrysler and Lincoln Continental buyers with five of the eight fuel economy variables turning out to be significant variables. 1977 Buick, Oldsmobile, Pontiac, and Cadillac buyers show:

### FUEL ECONOMY

- Better fuel economy rating.
- Better mileage — city and suburban.
- Higher percentage who found city and suburban mileage better than expected.
- Higher percentage who found highway mileage better than expected.
- Higher percentage where expected gas mileage influenced decision to buy a smaller car (17% for GM, 10% for competitive standards).

### EVALUATIVE RATINGS

Better ratings on:

- Ease of parking.
- Maneuverability in city traffic.
- Useable trunk space.

Poorer ratings on:

- Overall exterior styling.
- Overall interior roominess.

#### DESCRIPTIVE ASPECTS

- Higher percentage with 6 cylinder engines.

#### DEMOGRAPHICS

- Lower percentage who are male head of household.
- More formal education.
- Higher percentage whose occupation is professional/managerial.
- Higher income.

#### CORPORATE IMAGE

- Dropped an average of six percentage points while competitive makes remained about constant.

### 2.3 1977 CHEVROLET (DOWNSIZED VS. 1976 CHEVROLET (NOT DOWNSIZED))

Appendix Table 11 identifies the significant differences between the 1977 Chevrolet buyers and the 1976 Chevrolet buyers. Fuel economy attributes are again significant discriminants with six of the eight fuel economy attributes being significant variables. Buyers of 1977 Chevrolet show:

#### FUEL ECONOMY

- Higher percentage where expected gas mileage influenced decision to buy small car (30% for the 1977, 7% for the 1976).
- Higher percentage where expected gas mileage influenced decision to buy this particular car (41% for the 1977, 24% for the 1976).
- Better mileage — city and suburbs.
- Better mileage — highway.
- Better fuel economy rating.
- Better overall operating economy rating.

#### EVALUATIVE RATINGS

Better ratings on:

- Useable trunk space.

#### EVALUATIVE RATINGS (Cont'd)

Poorer ratings on:

- Overall satisfaction.
- Condition when delivered.
- Overall exterior styling.
- Overall interior roominess.
- Overall interior comfort.
- Smoothness of transmission.
- Reliable, trouble-free operation.

#### DESCRIPTIVE ASPECTS

- Higher percentage with 6 cylinder engine.
- Higher purchase price.
- Lower percentage who have owned this make before.
- Lower percentage with automatic transmission.

#### CORPORATE IMAGE

- Lower percentage among 1977 owners than 1976 owners who believe GM has:
  - Best looking cars.
  - Most comfortable riding cars.
  - Best engine performance.
  - Best resale value.

#### REPURCHASE INTENTIONS

- Lower percentage who would buy this make/series again.  
(70% for 1977 buyers, 81% for 1976 buyers).

#### DEMOGRAPHICS

- Lower percentage male.
- Lower percentage who are male head of household.
- Younger.
- Higher percentage who live in metropolitan areas or suburbs.

## 2.4 1977 VS. 1976 BUICK, OLDSMOBILE, PONTIAC AND CADILLAC

Here again the significant differences are similar to the differences between the 1977 and 1976 Chevrolet. And as in the low price segment, six out of the eight fuel economy attributes are also significant variables in the medium and high price segments. Medium and high price buyers, however, are more sensitive to size — overall length, interior roominess, comfort, and smoothness of ride are rated lower. The 22 variables that distinguish 1977 from 1976 Buick, Oldsmobile, Pontiac, and Cadillac buyers listed in Appendix Table 12 are summarized below. Buyers of 1977 Buick, Oldsmobile, Pontiac and Cadillac show:

### FUEL ECONOMY

- Higher percentage where expected gas mileage influenced decision to buy a smaller car (17% for the 1977, 5% for the 1976).
- Higher percentage where expected gas mileage influenced decision to buy this particular car (27% for the 1977, 16% for the 1976).
- Better fuel mileage — city and suburban.
- Better fuel mileage — highway.
- Better fuel economy rating.
- Better overall operating economy rating.

### EVALUATIVE RATINGS

Better ratings on:

- Ease of parking.

Poorer ratings on:

- Condition when delivered.
- Overall exterior styling.
- Overall length.
- Overall interior roominess.
- Overall interior comfort.
- Smoothness of ride.
- Smoothness of transmission.
- Reliable, trouble-free operation.

#### DESCRIPTIVE ASPECTS

- Higher percentage with 6 cylinder engine.

#### CORPORATE IMAGE

Lower percentage who believe GM has:

- Best looking cars.
- Most comfortable riding cars.

#### DEMOGRAPHICS

- Lower percentage male.
- Lower percentage married.
- Lower percentage male head of household.

#### REPURCHASE INTENTIONS

- Lower percentage who would buy this make again.  
(72% for 1977 buyers, 79% for 1976 buyers).

## 2.5 VARIABLES THAT DISTINGUISH 1977 GM MAKE/SERIES LOYALS FROM NON-LOYALS

Earlier tables indicated that 70% of the 1977 Chevrolet buyers and 72% of the 1977 Buick, Oldsmobile, Pontiac, and Cadillac buyers would buy the same make/series again. A two group discriminant analysis was run to determine the variables that distinguish loyals from non-loyals in each segment.

Details which appear in Appendix Table 13 and Appendix Table 14 are summarized below:

- Make/series loyals report higher MPG on both city/suburbs and highway driving.
- Make/series loyals rate the downsized GM cars better on all styling/appearance/roominess dimensions.
- Make/series loyals show higher evaluation of GM on appearance/comfort/performance/resale value.
- Make/series loyals exhibit:
  - Lower incidence of males
  - Lower average age
  - Higher formal education
- In short, there is some evidence of:
  - A halo effect for make/series loyals
  - An experience that is below expectation for non-loyals

### 3. MARKET BEHAVIOR

#### 3.1 SALES STATISTICS

Sales statistics in the automotive industry can become confusing because of two reasons.

1. Two different types of sales statistics are reported:

- a) retail sales
- b) registrations

2. Two different time frames are reported:

- a) calendar year
- b) model year

A brief discussion of the above is appropriate to document the discussion of share of market and changes in the composition of the market.

#### 3.2 RETAIL SALES

Retail sales are compiled by car manufacturers from reports submitted by dealers when retail sales are made. Sales data are used extensively in the industry principally because they are available within a few days of the reporting period — the most common being the very volatile ten day reports. That retail sales figures are not models of accuracy is understood and freely acknowledged in the industry. Revision of retail sales reports at a later date is not an uncommon occurrence.

One of the common formats for reporting new car retail sales is illustrated by Appendix Table 15, which shows units of sales and share of market by segment for calendar years 1976 and 1977. This format is used on a monthly and year to date basis during the calendar year.

#### 3.3 REGISTRATIONS

Registration figures, on the other hand, are compiled by R. L. Polk when the new cars are actually registered. Registration reports usually lag by about six to eight weeks. They have, however, a more official "carved in stone" quality that makes them more suitable for most analyses. Like retail sales reports, registration figures are also published on a monthly and year to date calendar basis.

### 3.4 REPORTING TIME FRAMES

The most common reporting time frame for both retail sales reports and registrations is by calendar year. However, the model year and the calendar year do not coincide. The new model year cars are usually introduced in the fall of the calendar year — for example, the 1977 models were introduced about the first of October 1976.

Calendar year reporting in the last three months of the calendar year for both sales and registrations include carryover stocks of the previous model year and the new model year being sold at the same time. Model year and calendar year overlap presents a problem if the analysis is concerned with model year.

If the analysis is model year — as it is in this study — a reasonably accurate approximation can be obtained by working with January through September registrations. October through December registrations contaminate the data because of the carryover from the previous model year. While it is possible to obtain special runs breaking out the sales of two model years during the same October through December period, the fact that the two model years are both available at the same time but at different levels as the inventory of the old model year is sold off, adds a complexity to the data beyond the scope of this study.

For the reasons mentioned above, this analysis is based on new car registrations, January through September 1976 and 1977, Appendix Table 16.

### 3.5 SHARE OF MARKET

The scope of the automotive market is such that each percentage point share of market translates into very large revenues. It is an industry rule of thumb that one percentage point in market share is equal to \$600,000,000 in revenues. With this in mind, the effect of downsizing on share of market is summarized as follows:

- The 1977 downsized GM standards increased their share of market from 13.4% in 1976 to 15.6% in 1977.
- All 1977 downsized makes, except Cadillac which remained unchanged, gained market share over 1976.
  - Chevrolet up from 4.6% to 5.8%
  - Buick up from 2.7% to 2.9%
  - Oldsmobile up from 2.6% to 3.0%
  - Pontiac up from 1.4% to 1.8%
  - Cadillac no change at 2.1%

- The 1977 Ford Motor Company non-downsized standard size makes lost market share from 5.6% in 1976 to 5.5% in 1977.
  - Ford down from 3.9% to 3.5%
  - Mercury up from 1.1% to 1.3%
  - Lincoln Continental up from 0.7% to 0.8%
  
- The 1977 Chrysler Corporation non-downsized standard size makes lost market share from 1.9% in 1976 to 1.7% in 1977.
  - Plymouth dropped from 0.5% to 0.4%
  - Dodge no change at 0.4%
  - Chrysler no change at 1.0%
  
- The total standard size segment increased its share of total industry registrations from 21.0% to 22.9%. Of this expanded standard size market:
  - GM increased its share from 63.9% to 68.3%
  - Ford Motor Company's share dropped from 27.1% to 24.3%
  - Chrysler Corporation's share dropped from 9.0% to 7.4%

### 3.6 CHANGES IN MARKET COMPOSITION

Measuring change in the composition of the market in the automotive industry is a complex affair. Traditionally, the industry relies on share of market, source of sales, and owner loyalty statistics.

Share of market has been discussed above. The discussion now turns to source of sales and owner loyalty.

### 3.7 SOURCE OF SALES

Source of sales is a description of the origin of the buyers of a particular make in terms of the previous car owning status of these buyers. It describes, in effect, where the business came from. The percentage base for source of sales is the total number of buyers of a particular make. The percentage distribution shows the origin of purchasers in terms of previous car owned, which is used for the percentage distribution regardless of whether the previous car owned was disposed of or kept.

Comparing the source of sales of the downsized 1977 standard size makes to their pre-downsized 1976 models reveals some interesting changes in the composition of the 1977 market. As pointed out earlier, these data are taken from a national probability sample of buyers who purchased their car new in the second quarter of the 1976 and 1977 model years.

Looking first at the standard size Chevrolet, it is relevant to note that total standard size Chevrolet registrations increased from 80,476 units in the second quarter of 1976 to 121,706 units in the second quarter of 1977 — an increase of 51.3% in a total new car market that increased by 12.3%.

During this same period, Chevrolet increased its share of market from 4.5% to 6.1%. The question is, where did this increased penetration of 1.6 percentage points come from?

Most of the increased penetration came from Chevrolet buyers who previously owned a General Motors car, but the percentage of sales that came from former Ford Motor Company car owners increased from 10.2% to 12.0%, or an increase of about 5,600 units.

Largest single make source of sales for the 1977 standard size Chevrolet was former standard Chevrolet owners which accounted for 51,500 units and 44.3% of total sales. This compares to 47.5% (38,174 units) for the 1976 model.

Sales of 1977 Chevrolets among former owners of cars manufactured by the Chevrolet Division, increased from 57.8% (46,473 units) to 59.1% (68,674 units).

The standard size 1977 Ford (not downsized), however, gained only 0.5% share of market in the second quarter compared to a 1.6% gain in share of market for Chevrolet. Whereas Chevrolet gained about 5,600 units from previous Ford Motor Company car owners, Ford gained about 3,400 units from previous General Motors car owners.

The largest make source of sales for the 1977 standard size Ford was from former Ford owners. However, previous Ford owners accounted for 55.9% (about 34,500 units) of standard size 1976 Ford sales in the second quarter. This dropped to 37.9% (about 28,600 units) in the second quarter of the 1977 model year. Furthermore, the percentage of 1976 model Ford sales accounted for by previous owners of a car manufactured by the Ford Division dropped from 65.3% for the 1976 model year to 56.2% in the 1977 model year.

The percentage of sales for both the 1977 standard size Chevrolet and the 1977 standard size Ford accounted for by previous standard size car owners declined in the 1977 model year, but more so for the standard size Ford than for the standard size Chevrolet.

### 3.8 OWNER LOYALTY - LOW PRICE STANDARDS

Owner loyalty is an accounting of the total number of owners of a particular make who entered the new car market in a specific period. It answers the question, "What makes were purchased by all the owners of a particular make who entered the new car market?" Contrary to source of sales (where the business came from) it describes, in effect, where the business went.

The key question here is what happened to former owners of standard size Chevrolet who entered the new car market? Did they opt for the new downsized standards, or did they switch? Compared to the 1976 model year (before downsizing), what percentage purchased a downsized 1977 standard size Chevrolet?

In the second quarter of the 1976 model year, 148,191 standard size Chevrolet owners entered the market and bought a new car. Of these, 38,174 or 25.7%, bought a new Chevrolet. In the second quarter of the 1977 model year, 166,822 standard size Chevrolet owners entered the market for a new car. Of these, about 51,500 or 31.0% bought a new downsized Chevrolet. With loyalty increasing from 25.7% in the second quarter of 1976 to 31.0% in the second quarter of 1977, it is clear that downsizing had a positive effect among Chevrolet's huge population of pre-downsized standard size Chevrolet owners.

On the other hand, 122,298 standard size Ford owners entered the market in the second quarter of 1976, of which about 34,500 (28.3%) bought another Ford. But in the second quarter of 1977, 123,007 standard size Ford owners entered the market for a new car. Of these, only 28,609 (23.3%) bought a standard size Ford.

Thus, while Chevrolet loyalty increased 5.4 percentage points in the second quarter of 1977, Ford loyalty dropped 5.0 percentage points in the same period. It is also important to note that of the previous Chevrolet owners who entered the market in the second quarter of 1977, the percentage that bought a car manufactured by General Motors Corporation increased by 3.1 percentage points (71.8% to 74.7%). Corporate loyalty for standard size Ford owners, however, dropped 1.6 percentage points (60.5% to 58.9%) in the same period.

The percentage of previous owners of standard size Chevrolet that switched to a car manufactured by the Ford Motor Company declined 1.8 percentage points, while the percentage of previous owners of standard size Ford that switched to a car manufactured by General Motors increased by 2.0 percentage points in the same period. Clearly, there was a reduction in the percentage of previous Chevrolet owners switching to Ford Motor Company, and a gain in the percentage of previous Ford owners switching to General Motors Corporation.

Looking at gains or losses to the imports reveals the same pattern. The percentage of previous Chevrolet owners that switched to an import decreased by 1.3 percentage points, while the percentage of previous Ford owners that switched to an import increased 2.4 percentage points.

### 3.9 OWNER LOYALTY - MEDIUM PRICE STANDARDS

A completely different pattern emerges when loyalty of previous owners of medium price standards (Buick, Oldsmobile, Pontiac, Mercury, Dodge, Chrysler) is examined. In fact, the pattern is reversed.

Buick shows a sharp decline of almost 10 percentage points in corporate loyalty. Switchers to Ford Motor Company almost doubled in the second quarter of 1977 from 9.3% to 17.0%.

Oldsmobile and Pontiac also show a decline in corporate loyalty. Former owners switching away from General Motors Corporation increased about 2 percentage points for Pontiac, 3 percentage points for Oldsmobile.

While owner loyalty for Buick, Oldsmobile, Pontiac and Cadillac declined, owner loyalty for Dodge and Chrysler increased. Mercury make loyalty increased, but division and corporate loyalty decreased.

### 3.10 OWNER LOYALTY - HIGH PRICE STANDARDS

Cadillac, historically the industry leader in make, division, and corporate loyalty, showed a drop in owner loyalty. The percentage switching away from the make increased by 5.3 percentage points — switching away from Cadillac Division increased by 5.7 percentage points, and switching away from the Corporation increased by 5.5 percentage points.

Previous Lincoln Continental owners on the other hand, while losing 2.3 percentage points in make loyalty, gained 4.7 percentage points in division loyalty and 5.1 percentage points in corporate loyalty.

### 3.11 REASONS FOR MAKE SELECTION

The data bank which is the data source for this study includes the response to the question, "Please tell us the THREE factors which were most important to you in your decision to buy the 1976 (1977) make you purchased rather than some other make". The respondent checks off three of a list of 24 possibilities.

Data relative to self-expressed reasons for make selection are used in the automotive industry with extreme caution. The consensus is that the responses should only be used as "indicators" in the broadest sense. For example, "price" as a reason for buying has a fairly high incidence among import and economy car buyers that declines progressively to a very low incidence for luxury cars. The incidence of "prestige" as a reason for buying logically moves in the opposite direction, higher for high price cars, lower for low price cars. "Prestige" is probably understated because it is not a socially acceptable self-expression.

Even with these data limitations in mind, some relevant observations can be made:

#### MILEAGE, FUEL ECONOMY

- Percent mentioning fuel economy as a reason for make selection doubled for Chevrolet from 1976 to 1977 (9.2% vs. 18.6%), while remaining constant for both Ford and Plymouth.
- Percent mentioning fuel economy as a reason for buying more than doubled for Buick, Oldsmobile and Pontiac (from 6.8, 8.2 and 7.2 respectively in 1976 to 19.0, 16.7 and 22.6 respectively in 1977), while Mercury remained constant at a low level (1.8% to 1.4%) and both Dodge and Chrysler declined.

#### SIZE AND WEIGHT

- Substantial improvement for Chevrolet from 1976 to 1977, marginal improvement for Buick, Oldsmobile, Pontiac and Cadillac.
- Substantial improvement for Ford, Mercury, Dodge, Chrysler and Lincoln Continental. This appears to be an apparent contradiction since actual size and weight did not change for any of these. However, the across the board consistency suggests some underlying reason exists. It could be conjectured that it reflects rejection of the downsizing in the competitive cars making one's own make purchased look better by comparison.

INTERIOR ROOMINESS

- Down marginally for Buick, Pontiac and Cadillac.
- Up substantially for Ford, Mercury, Dodge, and Lincoln Continental which in fact did not change 1976 to 1977. This also probably is a case of looking good by comparison to the competition.

#### 4. CONCLUSIONS

The automotive industry regards the downsizing by General Motors Corporation of its standard size cars as a massive endeavor that was brilliantly executed.

It is clear that the product strategy developed by General Motors Corporation was very successful. Overall exterior dimensions were reduced without reducing interior package dimensions. Weight was reduced and significant improvement in fuel economy was achieved.

The car buying public responded favorably to the scaled down General Motors Corporation 1977 standard size cars. Among the positive buyer perceptions, those who purchased the downsized cars did so with expectations (that were fulfilled) of better fuel economy, as well as increased maneuverability and ease of parking. Moreover, buyers of downsized cars also tended to reinforce the pursuit of fuel economy by also choosing 6 cylinder engines and manual transmissions to a greater extent than occurred prior to downsizing.

The evidence is clear that the expectation of improved fuel economy was an important motivator in make selection. There are dramatic differences in the percentage that indicated that expected gas mileage influenced the decision to buy a smaller car and to buy the particular downsized make selected.

That the downsizing did in fact result in better gas mileage is confirmed by buyers of 1976 and 1977 model year standard size cars. The average miles per gallon reported by General Motors Corporation standard size buyers increased about 1.8 miles per gallon for city and suburb driving, almost 2 miles per gallon for highway driving in the 1977 model year. The average gas mileage reported by standard size owners of Ford Motor Company and Chrysler Corporation standards, on the other hand, remained almost constant.

Recognition of improved mileage is also reflected by owners' evaluative rating of gas mileage. Owner ratings of gas mileage, still at a low level of satisfaction, increased marginally among buyers of 1977 model year GM standards, but remained constant among buyers of Ford Motor Company and Chrysler Corporation standards.

On the negative side, the downsized General Motors cars were perceived to lack style, roominess, comfort, smoothness of ride, and adequate length. Buyers gave their car low ratings

on transmission smoothness and reliable trouble-free operation. These do not necessarily follow from downsizing and may reflect particular problems in the introductory year of an all new car — a common occurrence in the industry.

In total, anticipation of increased fuel economy clearly was an important consideration. The cars were purchased in the face of lower satisfaction levels for styling and comfort. It appears that there will be a period of ambivalence where early adapters of the downsized cars experience both pleasure (through increased fuel economy) and lower levels of satisfaction with appearance and comfort. It is likely that an adjustment period of a year or two will improve adaptation to the smaller cars. It is conjectured that some of the negative associations with the downsized standards will diminish with the 1978 model buyers due to temporal adaptation and the fact that the General Motors intermediates and intermediate specialties are also downsized this year.

The final validation of the acceptance of the 1977 General Motors downsized standards comes from the market place. 1977 was a banner year for the industry, the second highest in history. General Motors downsized standards increased their industry share of this expanded market by about 2 percentage points.

While downsizing in the low price standard segment was favorably received by previous Chevrolet owners, previous owners of General Motors medium and high price cars (Buick, Oldsmobile, Pontiac and Cadillac) exhibited some sensitivity to size and weight reduction. In total, however, even these downsized makes gained market share over 1976.

We can conclude that the General Motors downsizing of its standard size cars not only was a significant fuel economy measure, but a success in the market place as well.

APPENDIX A  
TABLES  
TABLE 1

1976 BODY TYPE CLASSIFICATION  
USED BY GENERAL MOTORS CORPORATION

A-BODY

Chevelle Malibu  
LeMans  
Cutlass  
Century  
LTD II  
Cougar  
Fury  
Monaco  
Matador

A-SPECIAL

Grand Prix  
Monte Carlo  
Cordoba  
Charger  
Cougar

B-BODY

Chevrolet (Reg)  
Ford (Reg)  
Plymouth (Reg)  
Pontiac (Reg)  
Olds (Reg)  
Buick (Reg)  
Mercury (Reg)  
Dodge (Reg)  
Chrysler Newport

C-BODY

Bonneville  
Olds 98  
Buick Electra  
Cadillac  
Lincoln Continental  
New Yorker

E-BODY

Toronado  
Riviera  
Eldorado  
Thunderbird  
Mark IV  
Seville

F-BODY

Camaro  
Firebird

H-BODY

Vega  
Astre  
Pinto  
Bobcat  
Gremlin

H-SPECIAL

Monza  
Starfire  
Sunbird  
Skyhawk  
Mustang

T-CAR

Chevette  
Fiesta

Y-BODY

Corvette

X-BODY

Nova  
Monarch  
Comet  
Granada  
Maverick  
Valiant  
Dart  
Pacer  
Hornet  
Ventura  
Omega  
Skylark  
Volare  
Aspen

FOREIGN

## TABLE 2

## MARKET SEGMENT CLASSIFICATION

1976 MODEL YEAR

SUBCOMPACT

Astre  
Bobcat  
Chevette  
Gremlin  
Pinto  
Vega

INTERMEDIATE SPECIALTY

Charger  
Cordoba  
Cougar  
Elite  
Grand Prix  
Monte Carlo

SPORTY COMPACT

Camaro  
Firebird  
Monza  
Mustang II

LOW PRICE STANDARD

Chevrolet  
Ford  
Plymouth

LOW PRICE COMPACT

Hornet  
Maverick  
Nova  
Pacer  
Valiant

MEDIUM PRICE STANDARD

Buick  
Chrysler  
Dodge  
Mercury  
Oldsmobile  
Pontiac

MEDIUM PRICE COMPACT

Comet  
Dart  
Omega  
Skylark  
Ventura

LUXURY PERSONAL

Corvette  
Riviera  
Thunderbird  
Toronado

LUXURY COMPACT

Granada  
Monarch

LUXURY

Cadillac  
Lincoln Continental  
Seville

LOW PRICE INTERMEDIATE

Chevelle  
Fury  
Matador  
Torino

LUXURY SPECIALTY

Continental Mark IV  
Eldorado

MEDIUM PRICE INTERMEDIATE

Century  
Coronet  
Cutlass  
LeMans  
Montego

IMPORTS

Economy  
High Series  
Sporty  
Luxury

TABLE 3

DIMENSIONS OF GENERAL MOTORS  
1976 AND 1977 STANDARD SIZE MAKES

	<u>1976 (1)</u>	<u>1977 (2)</u>	<u>1977 + 1976</u>
<u>Chevrolet (V-8)</u>			
Wheelbase (in.)	121.5	116	- 5.5
Overall Length (in.)	222.7	212.1	- 10.6
Overall Width (in.)	79.5	76	- 3.5
Overall Height (in.)	54.7	56	+ 1.3
Curb Weight (lbs.)	4361	3771	- 590
<u>Buick LeSabre (V-8)</u>			
Wheelbase (in.)	124	115.9	- 8.1
Overall Length (in.)	226.9	218.2	- 8.7
Overall Width (in.)	79.9	77.2	- 2.7
Overall Height (in.)	54	55.7	+ 1.7
Curb Weight (lbs.)	4468	3736	- 732
<u>Buick Electra (V-8)</u>			
Wheelbase (in.)	127	118.9	- 8.1
Overall Length (in.)	233.4	222.1	- 11.3
Overall Width (in.)	79.9	77.2	- 2.7
Overall Height (in.)	54.5	55.9	+ 1.4
Curb Weight (lbs.)	4797	3945	- 852
<u>Oldsmobile Delta 88 (V-8)</u>			
Wheelbase (in.)	124	116	- 8.0
Overall Length (in.)	226.7	217.5	- 9.2
Overall Width (in.)	79.9	76.8	- 3.1
Overall Height (in.)	54.5	55.2	+ 0.7
Curb Weight (lbs.)	4481	3727	- 754
<u>Oldsmobile 98 (V-8)</u>			
Wheelbase (in.)	127	119	- 8
Overall Length (in.)	232.2	220.4	- 11.8
Overall Width (in.)	79.8	76.8	- 3.0
Overall Height (in.)	54.7	56.5	+ 1.8
Curb Weight (lbs.)	4786	3985	- 801
<u>Pontiac (V-8)</u>			
Wheelbase (in.)	123.4	115.9	- 7.5
Overall Length (in.)	226	214.3	- 11.7
Overall Width (in.)	79.6	75.7	- 3.9
Overall Height (in.)	54.2	53.2	- 1.0
Curb Weight (lbs.)	4416	3704	- 712
<u>Cadillac DeVille (V-8)</u>			
Wheelbase (in.)	130	121.5	- 8.5
Overall Length (in.)	230.7	221.2	- 9.5
Overall Width (in.)	79.8	76.4	- 3.4
Overall Height (in.)	54.3	54.4	+ 0.1
Curb Weight (lbs.)	5273	4472	- 801

(1) Automotive News Market Data Book, 1976, p. 104

(2) Automotive News 1977 Market Data Book Issue, p. 109

TABLE 4  
DIMENSIONS OF FORD MOTOR COMPANY  
1976 AND 1977 STANDARD SIZE MAKES

	<u>1976</u>	<u>1977</u>	<u>1977 + 1976</u>
<b><u>Ford LTD (V-8)</u></b>			
Wheelbase (in.)	121	121	0
Overall Length (in.)	223.9	224.1	+ 0.2
Overall Width (in.)	79.5	79.5	0
Overall Height (in.)	54.8	54.8	0
Curb Weight (lbs.)	4451	4414	- 37
<b><u>Mercury Marquis (V-8)</u></b>			
Wheelbase (in.)	124	124	0
Overall Length (in.)	229	229	0
Overall Width (in.)	79.6	79.6	0
Overall Height (in.)	54.7	54.7	0
Curb Weight (lbs.)	4613	4552	- 61
<b><u>Lincoln Continental (V-8)</u></b>			
Wheelbase (in.)	127.2	127.2	0
Overall Length (in.)	232.9	233	+ 0.1
Overall Width (in.)	80.0	80.0	0
Overall Height (in.)	55.5	55.2	- 0.3
Curb Weight (lbs.)	5225	5052	- 173

TABLE 5  
DIMENSIONS OF CHRYSLER CORPORATION  
1976 AND 1977 STANDARD SIZE MAKES

	<u>1976</u>	<u>1977</u>	<u>1977 ± 1976</u>
<u>Plymouth Grand Fury (V-8)</u>			
Wheelbase (in.)	121.5	121.4	- 0.1
Overall Length (in.)	222.4	222.3	- 0.1
Overall Width (in.)	79.8	79.8	0
Overall Height (in.)	54.8	54.8	0
Curb Weight (lbs.)	4215	4213	- 2
<u>Dodge Monaco (V-8)</u>			
Wheelbase (in.)	121.5	121.4	- 0.1
Overall Length (in.)	225.7	225.6	- 0.1
Overall Width (in.)	79.8	79.8	0
Overall Height (in.)	54.8	54.7	- 0.1
Curb Weight (lbs.)	4250	4269	+ 19
<u>Chrysler Newport (V-8)</u>			
Wheelbase (in.)	124	124	0
Overall Length (in.)	227.1	226.6	- 0.5
Overall Width (in.)	79.5	79.5	0
Overall Height (in.)	55.2	55.1	- 0.1
Curb Weight (lbs.)	4555	4513	- 42
<u>Chrysler New Yorker (V-8)</u>			
Wheelbase (in.)	124	124	0
Overall Length (in.)	231	231	0
Overall Width (in.)	79.5	79.5	0
Overall Height (in.)	54.5	54.5	0
Curb Weight (lbs.)	4975	4880	- 95

TABLE 6

## PREDICTOR VARIABLES

Descriptive Aspects of New Car Purchased

- Has respondent owned this make before?
- Body style of new car
- Number of cylinders
- Transmission type
- Options purchased
- Purchase price
- Number of dealers visited
- Number of cars in household

New Car Evaluative Ratings

- Overall satisfaction
- Value for the money
- Condition when delivered
- Overall exterior styling
- Overall length
- Overall interior styling
- Overall interior roominess
- Overall interior comfort
- Overall useable trunk space
- Overall smoothness of ride
- Overall ease of parking
- Overall maneuverability in city traffic
- Pickup from standing start
- Pickup from passing at 45 MPH
- Ease of starting when cold
- Smoothness of transmission
- Reliable, trouble-free operation
- Quality of dealer service

Fuel Economy Ratings

- Overall operating economy
- Mileage (fuel economy)
- Miles per gallon (city and suburban driving)
- Percentage who find this more than expected (city and suburban driving)
- Miles per gallon (highway driving)
- Percentage who find this more than expected (highway driving)
- Influence of gas mileage on percentage buying smaller (rather than larger) car
- Influence of gas mileage on percentage buying this particular car

TABLE 6 (Cont'd)  
PREDICTOR VARIABLES

Corporate Image

- Best looking cars
- Most comfortable riding cars
- Best engine performance
- Best resale value

Owner Satisfaction and Repurchase Intentions

- Percentage whose satisfaction with new car is better than expected
- Percentage who would buy this same make/series again

Demographic Profile

- Sex
- Marital status
- Position in household
- Age
- Formal education
- Number of children under 6 years
- Total family size
- Occupation
- Location of residence
- Income

TABLE 7  
 1977 CHEVROLET STANDARD SIZE  
 VERSUS  
 1977 FORD/PLYMOUTH STANDARD SIZE CARS  
 Average Profiles on Significant Variables

	1977 Chevrolet	1977 Ford/Plymouth
<u>DESCRIPTIVE ASPECTS</u>		
Percentage whose car has 6 cylinders	14%	2%
Purchase Price -- net difference	\$3,788	\$4,119
<u>EVALUATIVE RATINGS*</u>		
Overall exterior styling	4.0	4.2
Usable trunk space	4.3	4.1
Ease of parking	4.3	3.9
Maneuverability in city traffic	4.4	4.1
Ease of starting when cold	4.0	3.8
Smoothness of transmission	3.5	3.8
<u>FUEL ECONOMY</u>		
Mileage (fuel economy) rating	3.2	2.9
MPG -- city and suburban	13.1	11.6
Percentage who find this better than expected	11%	6%
MPG -- Highway	16.2	14.6
Percentage who find this better than expected	11%	7%
Percentage where expected gas mileage influenced decision to buy smaller car	30%	6%
Percentage where expected gas mileage influenced decision to buy this particular car	41%	22%
<u>CORPORATE IMAGE</u>		
Percentage Who Believe GM Has:		
Best looking cars	64%	7%
Most comfortable riding cars	58%	7%
Best engine performance	60%	7%
Best resale value	67%	18%
<u>DEMOGRAPHICS</u>		
Percentage married	82%	80%
Formal education (in years)	12.4	12.0
Percentage whose occupation is professional/managerial	24%	17%

Discriminant function correctly classifies:

82% of 1977 Chevrolet Standard Buyers (376 out of 459)

93% of 1977 Ford/Plymouth Standard Buyers (336 out of 361)

- \*Five point rating scale: Excellent = 5
- Very good = 4
- Good = 3
- Fair = 2
- Poor = 1

TABLE 8

## 1976 CHEVROLET STANDARD SIZE

VERSUS

1976 FORD/PLYMOUTH STANDARD SIZE CARS  
Average Profiles on Significant Variables

	<u>1976 Chevrolet</u>	<u>1976 Ford</u> <u>1976 Plymouth</u>
<u>DESCRIPTIVE ASPECTS</u>		
Purchase price -- net difference	\$3,467	\$3,729
<u>EVALUATIVE RATINGS*</u>		
Ease of starting when cold	4.1	3.7
<u>CORPORATE IMAGE</u>		
Percentage Who Believe GM Has:		
Best looking cars	73%	9%
Most comfortable riding cars	66%	7%
Best engine performance	67%	7%
Best resale value	78%	18%
<u>DEMOGRAPHICS</u>		
Percentage married	85%	88%

\*Five point rating scale: Excellent = 5  
 Very good = 4  
 Good = 3  
 Fair = 2  
 Poor = 1

TABLE 9

## 1976 GM MEDIUM AND HIGH PRICE STANDARD SIZE

VERSUS

## 1976 FORD AND CHRYSLER MEDIUM AND HIGH PRICE STANDARD SIZE

Average Profiles on Significant Variables

	1976 Medium and High Price Standard Size Manufactured by		
	General Motors (1)	Ford Motor Company	(2)
		Chrysler Corporation	(3)
<u>DESCRIPTIVE ASPECTS</u>			
Percentage who have owned this make before	77%	68%	
Percentage whose car is a 2-door model	40%	21%	
Percentage whose car has vinyl top	82%	86%	
<u>EVALUATIVE RATINGS (4)</u>			
Ease of starting when cold	4.0	3.6	
Reliable, trouble-free operation	3.9	3.7	
<u>FUEL ECONOMY</u>			
MPG -- highway	14.8	14.5	
<u>CORPORATE IMAGE</u>			
Percentage Who Believe GM Has:			
Best looking cars	72%	10%	
Most comfortable riding cars	69%	4%	
Best engine performance	63%	10%	
Best resale value	72%	29%	
<u>DEMOGRAPHICS</u>			
Age (in years)	52.1	53.4	
Percentage who reside in metropolitan areas or big city suburbs	57%	42%	

(1) Buick, Oldsmobile, Pontiac, Cadillac

(2) Mercury Marquis, Lincoln Continental

(3) Dodge, Chrysler Newport, Chrysler New Yorker

(4) Five point scale: Excellent = 5

Very good = 4

Good = 3

Fair = 2

Poor = 1

TABLE 10

## 1977 GM MEDIUM AND HIGH PRICE STANDARD SIZE

VERSUS

## 1977 FORD AND CHRYSLER MEDIUM AND HIGH PRICE STANDARD SIZE

Average Profiles on Significant Variables

	1977 Medium and High Price Standard Size Manufactured by	
	General Motors (1)	Ford Motor Company (2) Chrysler Corporation (3)
<u>DESCRIPTIVE ASPECTS</u>		
Percentage who have owned this make before	75%	63%
Percentage whose car is a 2-door model	33%	25%
Percentage whose car has 6 cylinders	4%	2%
Percentage whose car has vinyl top	84%	90%
<u>EVALUATIVE RATINGS (4)</u>		
Overall exterior styling	4.0	4.3
Overall interior roominess	3.9	4.2
Usable trunk space	4.1	3.8
Ease of parking	4.3	3.9
Maneuverability in city traffic	4.4	4.2
Ease of starting when cold	4.1	3.8
Reliable, trouble-free operation	3.1	2.5
<u>FUEL ECONOMY</u>		
Mileage (fuel economy) rating	3.3	2.9
MPG -- city and suburban	12.8	11.3
Percentage who find this better than expected	14%	5%
MPG -- highway	15.8	14.7
Percentage who find this better than expected	14%	7%
Percentage where expected gas mileage influenced decision to buy smaller car	17%	10%
<u>CORPORATE IMAGE</u>		
Percentage Who Believe GM Has:		
Best looking cars	62%	10%
Most comfortable riding cars	60%	7%
Best engine performance	60%	10%
Best resale value	69%	31%
<u>DEMOGRAPHICS</u>		
Percentage who are male head of household	74%	79%
Age (in years)	51.3	53.4
Formal education (in years)	13.2	12.5
Percentage whose occupation is professional/managerial	30%	26%
Percentage who reside in metropolitan areas or big city suburbs	58%	42%
Income	\$28,674	\$23,744

Discriminant function correctly classifies:

82% of 1977 Other GM Standard Buyers (884 out of 1082)

91% of 1977 Ford/Chrysler Standard Buyers (643 out of 708)

(1) Buick, Oldsmobile, Pontiac, Cadillac

(2) Mercury Marquis, Lincoln Continental

(3) Dodge, Chrysler Newport, Chrysler New Yorker

(4) Five point scale

TABLE 11

## 1977 CHEVROLET STANDARD SIZE

VERSUS

## 1976 CHEVROLET STANDARD SIZE

## Average Profiles on Significant Variables

	1977 Chevrolet Standard	1976 Chevrolet Standard
<u>DESCRIPTIVE ASPECTS</u>		
Percentage who have owned this make before	78%	86%
Percentage whose car has 6 cylinders	14%	1%
Percentage whose car has automatic transmission	95%	99%
Purchase price -- net difference	\$3,788	\$3,467
<u>EVALUATIVE RATINGS*</u>		
Overall satisfaction	3.6	3.9
Condition when delivered	3.6	3.9
Overall exterior styling	4.0	4.3
Overall interior roominess	4.1	4.3
Overall interior comfort	4.1	4.3
Usable trunk space	4.3	4.1
Smoothness of transmission	3.5	4.1
Reliable, trouble-free operation	2.8	3.8
<u>FUEL ECONOMY</u>		
Overall operating economy rating	3.7	3.2
Mileage (fuel economy) rating	3.2	2.8
Percentage where expected gas mileage influenced decision to buy smaller car	30%	7%
Percentage where expected gas mileage influenced decision to buy this particular car	41%	24%
MPG -- city and suburbs	13.1	12.1
MPG -- highway	16.2	15.2
<u>CORPORATE IMAGE</u>		
Percentage Who Believe GM Has:		
Best looking cars	64%	73%
Most comfortable riding cars	58%	66%
Best engine performance	60%	68%
Best resale value	67%	78%
Percentage who would buy this make/series again	70%	81%
<u>DEMOGRAPHICS</u>		
Percentage male	76%	82%
Percentage who are male head of household	74%	79%
Age (in years)	49.6	51.1
Percentage who reside in metropolitan areas or big city suburbs	48%	43%
Discriminant function correctly classifies:		
87% of 1977 Chevrolet Standard Buyers (401 out of 459)		
95% of 1976 Chevrolet Standard Buyers (424 out of 445)		

\*Five point rating scale

TABLE 12

## 1977 VS. 1976 BUICK, OLDSMOBILE, PONTIAC, CADILLAC

## Average Profiles on Significant Variables

	<u>1977 B.O.P.</u> <u>Cadillac</u>	<u>1976 B.O.P.</u> <u>Cadillac</u>
<u>DESCRIPTIVE ASPECTS</u>		
Percentage whose car has 6 cylinders	4%	1%
<u>EVALUATIVE RATINGS*</u>		
Condition when delivered	3.6	3.8
Overall exterior styling	4.0	4.4
Overall length	4.0	4.2
Overall interior roominess	3.9	4.4
Overall interior comfort	4.0	4.5
Smoothness of ride	4.3	4.6
Ease of parking	4.3	4.1
Smoothness of transmission	3.9	4.2
Reliable, trouble-free operation	3.1	3.9
<u>FUEL ECONOMY</u>		
Overall operating economy rating	3.9	3.1
Mileage (fuel economy) rating	3.3	2.7
MPG -- city and suburban	12.8	11.5
MPG -- highway	15.8	14.8
Percentage where expected gas mileage influenced decision to buy smaller car	17%	5%
Percentage where expected gas mileage influenced decision to buy this particular car	27%	16%
<u>CORPORATE IMAGE</u>		
Percentage Who Believe GM Has:		
Best looking cars	62%	72%
Most comfortable riding cars	60%	69%
Percentage who would buy this make/series again	72%	79%
<u>DEMOGRAPHICS</u>		
Percentage male	78%	81%
Percentage married	83%	87%
Percentage who are male head of household	74%	78%

Discriminant function correctly classifies:

92% of 1977 Buick, Oldsmobile, Pontiac, Cadillac buyers (994 out of 1082)  
90% of 1976 Buick, Oldsmobile, Pontiac, Cadillac buyers (582 out of 645)

\*Five point scale:      Excellent = 5  
                           Very good = 4  
                           Good = 3  
                          Fair = 2  
                          Poor = 1

TABLE 13

VARIABLES THAT DISTINGUISH 1977-MODEL CHEVROLET  
STANDARD MAKE/SERIES NON-LOYALS FROM LOYALS

<u>Variable</u>	<u>Means</u>	
	<u>Non-Loyals</u>	<u>Loyals</u>
Overall exterior styling rating	3.6	4.2
Overall length rating	3.7	4.1
Overall interior styling rating	3.8	4.3
Overall interior roominess rating	3.7	4.3
Overall interior comfort rating	3.7	4.3
Smoothness of ride rating	3.9	4.4
Usable trunk space rating	4.0	4.4
Ease of parking rating	4.1	4.4
Maneuverability in city traffic rating	4.2	4.4
Overall operating economy rating	3.1	3.9
Fuel economy rating	2.7	3.3
MPG -- City and suburbs	12.5	13.4
MPG -- Highway	15.6	16.4
GM has best looking car	51%	69%
GM has most comfortable riding car	40%	66%
GM has best engine performance	50%	64%
GM has best resale value	59%	70%
Percentage male	78%	76%
Age (in years)	50.4	49.3
Formal education (in years)	12.1	12.6

Discriminant function correctly classifies:  
 71% of non-loyals (97 out of 136)  
 75% of loyals (241 out of 323)

TABLE 14

VARIABLES THAT DISTINGUISH 1977-MODEL  
BUICK, OLDSMOBILE, PONTIAC AND CADILLAC  
MAKE/SERIES NON-LOYALS FROM LOYALS

<u>Variable</u>	<u>Means</u>	
	<u>Non-Loyals</u>	<u>Loyals</u>
Overall exterior styling rating	3.6	4.2
Overall length rating	3.6	4.1
Overall interior styling rating	3.9	4.4
Overall interior roominess rating	3.4	4.1
Overall interior comfort rating	3.6	4.2
Smoothness of ride rating	3.7	4.5
Usable trunk space rating	3.7	4.3
Ease of parking rating	4.1	4.4
Maneuverability in city traffic rating	4.1	4.5
Overall operating economy rating	3.3	4.1
Fuel economy rating	2.9	3.5
MPG -- City and Suburbs	12.3	13.0
MPG -- Highway	15.2	16.1
GM has best looking car	46%	68%
GM has most comfortable riding car	45%	66%
GM has best engine performance	47%	65%
GM has best resale value	59%	73%
Percentage male	83%	76%
Age (in years)	52.1	51.0
Formal education (in years)	13.0	13.2

Discriminant function correctly classifies:  
66% of non-loyals (200 out of 303)  
78% of loyals (609 out of 779)

TABLE 15  
NEW CAR SALES  
Calendar Years 1976 and 1977

SEGMENT	1976		1977	
	Number	%	Number	%
<u>Small</u>	3,435,596	34.02%	3,317,203	29.68%
Sub-Compact	999,377	9.90	952,365	8.52
Compact	2,436,219	24.12	2,364,838	21.16
<u>Intermediate</u>	2,845,207	28.17	3,009,209	26.92
<u>Standard</u>	2,284,097	22.62	2,735,471	24.47
<u>Specialty</u>	41,673	0.41	42,571	0.38
TOTAL U. S.	8,606,573	85.22	9,104,454	81.45
<u>Import</u>	1,493,000	14.78	2,074,100	18.55
TOTAL INDUSTRY	10,099,573	100.00%	11,178,554	100.00%

Source: Automotive News, January 16, 1978, p. 6

TABLE 16

NEW CAR REGISTRATIONS  
JANUARY THRU SEPTEMBER  
1976 AND 1977

	1976		1977	
	<u>Number</u>	<u>Market Share</u>	<u>Number</u>	<u>Market Share</u>
<b>STANDARD SIZE MAKES</b>				
<b><u>General Motors</u></b>				
Chevrolet	333,664	4.6%	468,784	5.8%
Pontiac	100,187	1.4	143,167	1.8
Oldsmobile	190,730	2.6	245,203	3.0
Buick	196,771	2.7	234,236	2.9
Cadillac	<u>152,564</u>	<u>2.1</u>	<u>169,811</u>	<u>2.1</u>
TOTAL GM STANDARD SIZE	973,916	13.4	1,261,201	15.6
<b><u>Ford Motor Company</u></b>				
Ford	284,683	3.9	281,884	3.5
Mercury	81,047	1.1	101,718	1.3
Lincoln Continental	<u>47,302</u>	<u>0.7</u>	<u>64,278</u>	<u>0.8</u>
TOTAL FORD STANDARD SIZE	413,032	5.7	447,880	5.6
<b><u>Chrysler Corporation</u></b>				
Plymouth	38,450	0.5	29,226	0.4
Dodge	27,981	0.4	28,606	0.4
Chrysler	<u>70,419</u>	<u>1.0</u>	<u>79,279</u>	<u>1.0</u>
TOTAL CHRYSLER STANDARD SIZE	136,850	1.9	137,111	1.7
TOTAL STANDARD SIZE MAKES	1,523,798	21.0	1,846,192	22.9
SMALL	2,487,093	34.3	2,290,827	28.4
INTERMEDIATE	2,019,423	27.8	2,206,683	27.3
LUXURY SPECIALTY	154,864	2.1	185,797	2.3
MISCELLANEOUS	<u>3,802</u>	<u>0.1</u>	<u>3,874</u>	<u>0.1</u>
*TOTAL U. S.	6,188,980	85.3	6,533,373	81.0
IMPORT	<u>1,062,673</u>	<u>14.7</u>	<u>1,537,294</u>	<u>19.0</u>
*TOTAL INDUSTRY	7,251,653	100.0%	8,070,667	100.0%

\*Excludes vans, van wagons

Source: Automotive News, November 28, 1977, p. 51

APPENDIX B  
REPORT OF NEW TECHNOLOGY

The work performed under this contract, while leading to no new technology, has led to an analysis of consumer automotive preference with regard to fuel economy measures.

HE

18•5

A34

TO • BORROWER

DOT-TSG

NHTSA-

78-38 CTS

*Post Test*

Form DOT F 172  
FORMERLY FORM D

U.S. DEPARTMENT OF TRANSPORTATION  
SEARCH AND SPECIAL PROGRAMS ADMINISTRATION

TRANSPORTATION SYSTEMS CENTER  
KENDALL SQUARE, CAMBRIDGE, MA. 02142

U.S. DEPARTMENT OF TRANSPORTATION

POSTAGE AND FEES PAID  
613

00347466

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE: \$300

